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An Integrated Pest Management System Development: An Economic Valuation Analysis

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Abstract: This study aims to determine the socio-economic characteristics of Tajuk Village farmers and determine the conditions as well as management of agriculture on broccoli and cabbage vegetables, also designing alternative proposals for management of conventional farming systems into agriculture using an Integrated Pest Management system in Tajuk Village, Semarang District. By using Mix Method, a combination of qualitative and quantitative approaches, the research was to determine the amount of farmers' willingness to pay using the Contingent Valuation Method and see the benefits that could be obtained with a different farming system. The results showed that by using the Willingness to Pay (WTP) Analysis, there were 94.55% of farmers in Tajuk Village who were willing to pay the value of the offer given. Thus, it obtained an average value of WTP of IDR 41,000 with a total value of WTP on changes in the Integrated Pest Management system of IDR 3,034,000 per harvest. Besides, the total annual WTP value was IDR 6,068,000. This WTP value can be used as the cost of planning the development of an Integrated Pest Management system in Tajuk Village by collaborating with the development plan by the Stakeholders in the planned program involvement. The stakeholders classified as key players were the Agriculture and Plantation Office, Horticultural Food Crops Research Institute (BPTPH), Pest Disease Control (PHP), Plant Disturbing Organism Observers (POPT), and Head of Farmer Groups. The actors were the Village Authority, Sub-district Authority, and business people. While academics act as context setters.
Keywords: Integrated Pest Management System; Willingness to Pay; Stakeholders; Agricultural; Tajuk Village
JEL Classification: Q10; Q16; Q51

Introduction

The agricultural sector's role in the country's economic development is essential because most people in a developing country depend on agriculture. If planners earnestly pay attention to its people's welfare, one of the methods is to improve agricultural people's welfare. This method can be achieved by increasing their received price upon the agricultural products. Increasing agricultural product price means that the quality of the agricultural products needs to be improved to possess a higher economic value, which then increases agricultural people's income and their welfare.

With a total citizen of more than 240 million and a growing degree of approximately 1.7% per year, Indonesia needs more diverse crops. The improvement of crop quality and quantity is necessary to maintain the stability of the national crop.

Product domestic bruto growth of the agricultural sector experienced a declining trend from 2010 to 2018 (Badan Pusat Statistik, 2018). It showed that there were productivity problems from Indonesian farmers. Increased agricultural production output was affected by agricultural input factors such as labor, technology, land, management, and capital (Dewi, Utama, & Yuliarmi, 2017). (Adhitya, Hartono, & Awirya, 2013) in their study found that some of the agricultural inputs that positively affected the crop productivity were capital, research budget and agricultural development, and agriculture land. Meanwhile, factors that negatively affected crop productivity were urea fertilizer usage and labor. A study by Akbar also stated that paddy crops were negatively affected by urea fertilizer usage. (Andayani, 2016) added that inorganic fertilizers negatively affected red chili crop productivity, but an appropriate usage of pesticides positively affected crop productivity. (Masithoh, 2013) stated that extensive use of chemical fertilizers and pesticides has to be reduced because it was economically inefficient and technically caused a decrease in crop production.

Agrochemicals usage (fertilizers and pesticides) was included in modern agriculture that supports instant and faster agricultural production (Srivastav, 2020). However, chemical usage will reduce soil fertility and pollute water (environmental pollution) (Philippe, Neveen, Marwa, & Basel, 2021). Besides, agrochemical usage has harmful effects (i) harmful for farmers' health (Yuantari, Widianarko, & Rya, 2015) and; (ii) for consumers' health such as cancer, kidney, infertility in both men and women, hormonal disorders, neuron disorder, and immune system disorders (Srivastav, 2020). Nevertheless, chemical fertilizers and pesticides have been increasing agricultural production for the last century (Kılıç, Boz, & Eryılmaz, 2020). Therefore, chemical fertilizer and pesticide usage are vital for agricultural production, especially in developing countries (Loha, Lamoree, Weiss, & de Boer, 2018).

Various literature regarding agrochemicals as the factor affecting agricultural productivity may empirically illustrate that agrochemicals are widely used by Indonesian farmers. However, agrochemical usage's adverse effects are inefficient work, environmental pollution (land, water), and human health (farmers and consumers). Ineffective and inefficient benefits and weaknesses of agrochemicals encourage the government in introducing the Integrated Pest Control program since 1997/1998 according to the Act No. 12 of 1992 regarding Plant Cultivation System and PP No. 6 of 1995 regarding Plant Protection (Agustian & Benny, 2015). The IPC program aims to control the pest attack with an integrated control technique to prevent economic loss and environmental damage and create sustainable agriculture (Sari, Fatchiya, & Tjitropranoto, 2016). The success key of IPC implementation is agricultural managers' knowledge of plant pests, plant cultivation (appropriate fertilizing, excellent tillage, superior seeds choice, and pruning post-harvesting), and its interaction with environmental factors (area). The study result of (Mariyono & Irham, 2010) showed the IPC program that had successfully reduce chemical pesticides in paddy and soy in Yogyakarta. The IPC successfully saved production and external costs. This program also successfully increased the farmers' health. A study by (Agustian & Benny, 2015) regarding the IPC program implemented by farmers explained that the IPC program was relatively well-implemented by farmers, though its implementation was incomplete due to internal and external obstacles. Also, the IPC technology implementation on plantation commodity improved profit more than the improved costs (Sari et al., 2016).

The IPC implementation in a study (Agustian & Benny, 2015) explained as an integrated activity between the central and local, in which its execution involving the role of local government, department, and field farmers, where the IPC organization is one of the Sekolah Lapang Pengendalian Hama Terpadu (SLPHT) activity outcomes sourced from the Central and Local budgets. The IPC organization scope involved stakeholders with a role in agricultural development. The presence of partnerships on all stakeholders may increase awareness of existing problems and responsibility in making decisions. The success in partnership has to be accompanied by resources development and management implementation (Rani, 2019). Stakeholders are individuals, organizations, or groups that may be affected by activity and involved in the decision-making process (Rani, 2009). Meanwhile, according to (Pomeroy, Katon, & Harkes, 2001), stakeholders are individuals, organizations, or groups that are involved, interested, or affected (either positive or negative) by a specific activity.

Semarang is an area with agricultural potential. The agriculture sector in Semarang is mainly located in Semarang Regency. It is caused by the Semarang Regency contour that is suitable for the agriculture sector. Statistics Indonesia explained that vegetable production in Semarang Regency in 2010-2018 was dominated by cabbage that reached 370,799 quintals in 2016, followed by a decrease to 300,127 quintals in 2017. Fruits and vegetable productions in Semarang Regency in 2011-2016 explained a stagnant condition of vegetable production from 2011 to 2015 that ranged from 1,000,000 quintals to 1,200,000 quintals but followed by an increase in 2016 to 1,600,000 quintals (Badan Pusat Statistik, 2018).

Tajuk Village, Getasan Sub-district, Semarang Regency is one of the villages which its citizens work as farmers. Statistics Indonesia explained that Getasan Sub-district is the third-biggest fruit producer in Semarang Regency with 91,423 quintals. Tajuk Village farmers realize the danger of chemical usage in eradicating pests using inorganic fertilizers and medicines that may destroy soil nutrients. Vegetable farmers in Tajuk Village have created a group to converse the old system into the new one, implementing the Integrated Pest Control system. However, the program has not been executed well. The economic assessment to understand the IPC program execution in the agricultural system can be carried out through economic valuation. The economic valuation is used to conduct economic instruments using a particular assessment technique to estimate the monetary value of goods and services given by a natural resource (Hadad, 2012). The economic valuation is based on the economic value defined as the maximum amount of one's sacrifice for their goods and services to obtain other goods and services. The economic valuation used in estimating farmers' willingness to implement the IPC program can be analyzed with the contingent valuation method (dependent) where the information received is highly dependent on the built hypothesis. Farmers need the decision to determine the maximum sacrifice in the form of production cost that they can give to adopt the new system (Adnyana, 2016). Yana (2016) then explained further that price agreed by users plays a significant role in the farmer's decision making as a buyer to determine the maximum price to be paid upon a product to be sold.

Further study is needed to understand the farmers' willingness in executing the IPC program, considering that other studies often discussed the execution impact of SLPHT, instead of farmers' willingness in Tajuk Village to well-executing the IPC program. Therefore, it is necessary to analyze the farmers' willingness to develop an organic-based agricultural system and understand stakeholders' role in maintaining IPC execution in Tajuk Village. Based on the background, this study aimed to estimate the farmers' willingness to pay in implementing the IPC program in Tajuk Village and analyze the stakeholders' role in the IPC program execution in Tajuk Village.

Research Method

Study site

This study was conducted at Tajuk Village Getasan Sub-district Semarang Regency. Tajuk Village citizens' occupation is mainly farmers or growers, with 46.5 percent or 1919 people who work as farmers. The study site was chosen because Tajuk Village is one of the villages that realize the potential and extra awareness to change the sustainable agricultural system to improve the quality of vegetable plants, minimalize loss due to pests, and maintain soil fertility.

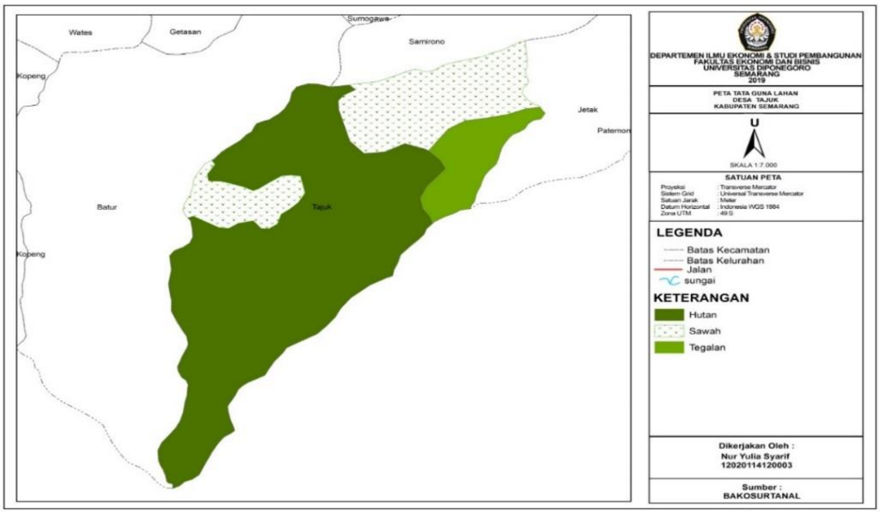

Figure 1 Tajuk Village area

Data

This study used primary data collected from a direct interview with key informants (farmers) and key persons (stakeholders). The sampling technique used was purposive sampling, where samples were collected based on predetermined criteria (Sekaran & Bougie, 2017). Key persons selected in the study were farmers who plant similar vegetables, i.e., broccoli, cabbage, and Chinese cabbage in Tajuk Village with a total of 74 respondents, while key informants collected in this study were eight respondents involved in an institution or organization that has a role in developing the integrated control system.

Analysis method

The descriptive analysis was applied to understand the socio-economic characteristics of key informants (farmers), the contingent valuation method analysis using the willingness to pay method to estimate farmers' willingness in implementing the organic system, and stakeholder analysis used to analyze the role and importance of stakeholders as actors in developing the integrated control system.

Contingent Valuation Method

The willingness to pay approach used to understand the farmers' willingness to pay will determine their decision to pay for a new product (Adnyana & Wardana, 2016) (Priyambodo, 2017). The new product in this study was the vegetable products produced using a new system, i.e., organic system. The first step in using the CVM method was giving an illustration to respondents regarding the benefits of producing crops using the organic system. The second step, the bid determination offered by respondents in this study using the bidding game technique. This technique was implemented by giving a bid to respondents from the lowest to the highest value. The bid offered to respondents came from production cost components and long- and short-term equipment. In the third step, the WTP average calculation was from the total WTP divided by the total respondents (Fauzi, 2004). The last step in this study was aggregating the converted bidding average from sample average to overall population average. One way to convert this value is by multiplying the sample average with the total population (n). The people WTP total value can be calculated using the following formula (Fauzi, 2004).

$$EWTP = \frac{\sum_{i=1}^{n} Wi}{n}$$

The final stage of this research is to aggregate the auction mean that was converted by the sample mean data to population data overall. One way to convert this is to multiply the sample mean by the population number (n). The total value of citizens WTP could be calculated using the following formula (Fauzi, 2004).

Stakeholder Analysis

Stakeholder analysis is done with the aim to analyze the level of importance and the influence of each stakeholder in the development of an Integrated Pest Control system. The plan of the system development involves nine incorporated stakeholders. These stakeholders include the Department of Agriculture and Plantation, Horticultural Food

Crops Research Institute (BPTPH), Pest and Disease Control (PHP), Officers of Plant Disturbing Organism Controller (POPT), Organic plant entrepreneurs, Village Authorities, Sub-district Authorities, Head of Farmers Groups and Academics.

Stakeholder analysis is carried out by key informants from the main stakeholder. The results are critical to know their interests and concerns and to be organized and able to participate in decision making (Pomeroy & Rivera-Guieb, 2005). The steps in stakeholder analysis are as follows (Rani, 2019):

1. Identify stakeholders
2. Assessing the influence, interests, and potential impacts of stakeholders.
3. Distinguish and categorize stakeholders based on interests.
4. Knowing the relationship of stakeholders

Stakeholder assessment uses MACTOR software, which is assessed using a Likert scale, namely the value of +4 or -4 (strongly agree or strongly disagree), +3 or -3 (strongly agree or strongly disagree), +2 or -2 (agree or disagree), +1 or -1 (somewhat agree or slightly disagree) and 0 = neutral. MACTOR is intended to influence concept development (Bendahan, 2003). Stakeholder analysis mapping consists of 4 quadrants, namely context setters, key players, subjects, and crowd (Rani, 2009).

Result and Discussion

Farmers in Tajuk Village still believe that chemical pesticides eradicate pests rapidly without considering future impacts. However, three farmer groups have been established that realize the importance of agricultural system change to maintain the environment and soil fertility to achieve higher economic value from the generated output. These farmer groups were Mekar Anom, Mekar Asih, and Ngudi Lestari. The Table 1 is the socio-economic characteristics of farmer group members created to convert the conventional agricultural system to organic agriculture.

Table 1 Socio-Economic Characteristics of Farmers in Tajuk Village

Respondent Characteristics		Frequencies	Percentages	(N = 74)
Age	20-40	34	45.9	Mean = 40.3
	41-60	40	54.1	Max = 57
	>60	0		Min = 19
Gender	Male	46	62.2	
	Female	28	37.8	
Marital Status	Merried	69	93.2	
	Single	5	6.8	
Land Area	<900 m^2	14	18.2	Mean = 2,727.7
	1,000 – 5,000 m^2	55	74.3	Max = 10,000
	5,500 – 10,000 m^2	5	6.8	Min = 400
	>10,000 m^2	0	0.0	
Education Level	Primary	40	54.1	Mean = 8
	Junior High	18	24.3	Max = 6
	Senior High	16	21.6	Min = 12

Source: Derived from Field Data, 2019

Analysis of Contingent Valuation Method

The technique used in this study to determine the value of WTP is the Bidding Game approach, where this technique is applied by providing a bid value to respondents from a small value to a large one. Bidding games are included in closed questions where this technique makes it easier for respondents to answer bid questions that are willing to be accepted and this technique has another advantage, which is to minimize bias when respondents state the value they are willing to pay compared to using the open-ended method (Whitehead & Haab, 2013). This technique is easier for respondents because it helps respondents to consider their preferences carefully with iterations that are asked with several yes and no rounds, which are then, in the end, asked, *"how much money are willing to be paid in order to implement an organic farming system"* (Tresnadi, 2000). The bid value given to respondents comes from the component of production costs and the short-term and long-term component of tool costs.

Table 2 Calculation of the Component of Cost and Tools in Scenario 1 (per harvest time)

Component	Unit	Volume	Price	Total
Quality Seeds	4705 Plants	1,000m^2	Rp 60/Plant	Rp 282,300
Fertilizer	20 Kg	1,000m^2	Rp 25,000/20Kg	Rp 1,250,000
Liquid Organic Fertilizer (Ferinsa)	6 L	1,000m^2	Rp 10,000/L	Rp 60,000
Mikro organisme local	2 L	1,000m^2	Rp 10,000/L	Rp 20,000
Organic Pesticide (Daun Suren)	5 L	1,000m^2	Rp 5,000/L	Rp 25,000
Physical and Machanical control :				
Plastic Mulch	20 Kg	1,000m^2	Rp 30,000/Kg	Rp 600,000
Mini Green House	76 Unit	1,000m^2	RP 20,000/Unit	Rp 1,520,000
Planting Hoe	2 Unit	1,000m^2	Rp 75,000/Unit	Rp 150,000
Watering Plants (Gembor)	2 Unit	1,000m^2	Rp 60,000/Unit	Rp 120,000
Sickle (Sabit)	1 Unit	1,000m^2	Rp 30,000/Unit	Rp 30,000
Sprayer Electric	1 Unit	1,000m^2	Rp 650,000/Unit	Rp 650,000
Total				Rp 4,707,300

Source: Derived from Field Data, 2019.

Calculation in Scenario 1 The amount of the Willingness to Pay value, there is a component of the cost of the tools, which includes Planting hoe, electric sprayer, Plastic mulch, watering Plants, sickle, and mini greenhouse. The component of the tools has economic value that can be calculated in terms of its economic life. After knowing the economic value of each tool, it can be calculated the bid value given to respondents who come from maintenance costs (seeds, fertilizers, pesticides) plus short-term maintenance costs. The following is scenario calculation 1:

Table 3 Calculations for Maintenance of Tools in Short-Term

Tools	Amount (unit/kg)	Purchase/ unit (Rp)	Total Price	Estimated economic value (year)	Depreciation cost
Planting Hoe	2 unit	Rp 75,000	Rp 150,000	5	Rp 30,000
Plastic Bucket	2 unit	Rp 35,000	Rp 70,000	5	Rp 14,000
Sprayer electric	1 unit	Rp 650,000	Rp 650,000	5	Rp 130,000
Mini Green House	1 unit	Rp 1,250,000	Rp 1,250,000	1	Rp 1,250,000
Watering Plants (Gembor)	2 unit	Rp 60,000	Rp 120,000	5	Rp 24,000
Sickle (Sabit)	1 unit	Rp 75,000	Rp 75,000	3	Rp 25,000
Plastic Mulch	20 kg	Rp 30,000	Rp 600,000	1	Rp 600,000
			Rp 2,073,000		
Total Depreciation cost (per year) Total Depreciation cost (per harvest time)		Rp 1,036,500			

The tools needed have economic value according to the economic life of each tool. Table 3 explains the calculation of the estimated depreciation expense of each tool, which has an economic life of fewer than five years in the form of hoe, bucket, electric sprayer, mini-greenhouse, watering can, sickle, and Plastic mulch.

Table 4 Calculations for Scenario 1

Component	Total
Maintenance Cost (Seeds, Fertilizer, Pesticide)	Rp 1,637,300
Cost of Tools	Rp 1,036,500
Total	Rp 2,673,800
	Total Price: Farmers Rp 2,673,800: 74
Bid Skenario 1	**Rp 36,132,432**

Table 5 Calculation of the Component of Cost and Tools in Scenario 2 (harvest time)

Component	Unit	Volume	Price	Total
Quality Seeds	4705 Plants	1,000m²	Rp 60/Plant	Rp 282,300
Fertilizer	20 Kg	1,000m²	Rp 25,000/20Kg	Rp 1,250,000
Liquid Organic Fertilizer (Ferinsa)	6 L	1,000m²	Rp 10,000/L	Rp 60,000
Micro Organism Local	2 L	1,000m²	Rp 10,000/L	Rp 20,000
Solid Pesticide (Agency Hayati):				
Beauveria Basiana	3 Pack	1,000m²	Rp 5,000/ Pack	Rp 15,000
Metarizium	3 Pack	1,000m²	Rp 5,000/ Pack	Rp 15,000
Trikoderma	3 Pack	1,000m²	Rp 5,000/ Pack	Rp 15,000
Gliokladium	3 Pack	1,000m²	Rp 5,000/ Pack	Rp 15,000
Liquid Pesticide :				
Organic Pesticide (Daun Suren)	5 L	1,000m²	Rp 5,000/L	Rp 250,000
PGPR (Plant Growth Promoting Rizobacterium)	2 L	1,000m²	Rp 10,000/L	Rp 20,000
Refugia	100 Plants	1,000m²	Rp 1,000/Plant	Rp 100,000
Physical and Machanical :				
Plastic Mulch	20 Kg	1,000m²	Rp 30,000/Kg	Rp 600,000
Green House	1 Unit	1,000m²	Rp 15,000.000/Unit	Rp 15,000,000
Planting Hoe	2 Unit	1,000m²	Rp 75,000/Unit	Rp 150,000
Watering Plants (Gembor)	2 Unit	1,000m²	Rp 60,000/Unit	Rp 120,000
Sickle (Sabit)	1 Unit	1,000m²	Rp 30,000/Unit	Rp 30,000
Sprayer Electric	1 Unit	1,000m²	Rp 650,000/Unit	Rp 650,000
Total				Rp 18,592,300

Scenario 1 is obtained from the component of maintenance cost and the component cost of tools for short-term for less than five years divided by the total number of farmers who want to convert organic-based farming systems. While scenario 2 is obtained from the component of maintenance costs and the component cost of tools for long-term divided by the total respondents. The calculation table of bid values 2 in Table 5.

Calculation in Scenario 2 The amount of the Willingness to Pay value, there is a component of the cost of the tools, including hoe, electric sprayer, mulch, watering can, sickle, and mini greenhouse. The component of the tools has economic value that can be calculated in terms of its economic life.

Table 6 Calculation for Maintenance of Tools in Long-Term

Tools	Amount (unit/kg)	Purchase Per unit (Rp)	Total Price	Estimated economic value (year)	Depreciation cost
Planting Hoe	2 unit	Rp 75,000	Rp 15,000	5	Rp 30,000
Plastic Bucket	2 unit	Rp 35,000	Rp 70,000	5	Rp 14,000
Sprayer electric	1 unit	Rp 650,000	Rp 650,000	5	Rp 130,000
Green House	1 unit	Rp 15,000,000	Rp 15,000,000	7	Rp 2,142,857
WateringPlants (Gembor)	2 unit	Rp 60,000	Rp 120,000	5	Rp 24,000
Sickle (Sabit)	1 unit	Rp 75,000	Rp 75,000	3	Rp 25,000
Plastic Mulch	20 kg	Rp 30,000	Rp 600,000	1	Rp 600,000
Total Depreciation cost (per year)					Rp 2,965,857
Total Depreciation cost (per harvest time)					Rp 1,482,929

After knowing the economic value of each tool, it can be calculated the bid value given to respondents who come from maintenance costs (seeds, fertilizers, pesticides) plus long-term maintenance costs.

Table 7 Calculations for Scenario 2

Component	Total
Maintenance Cost (Seeds, Fertilizer, pesticide)	Rp 1,637,300
Cost of Tools	Rp 1,482,929
Total	Rp 3,120,229
	Total Price: Farmers Rp 3,120,229: 74
Bid Scenario 2	Rp 42,165,257

Scenario 2 is obtained from the component of maintenance cost (fertilizers, seeds, and pesticides) and the component cost of tools for more than five years divided by the total number of farmers who want to change the conventional farming system with a better system that is organic based-system. The results of the calculations of bid value of scenario 2 are IDR 42,165,257

Offered Bid

The offered bids in the study comprised two choices, scenario 1 of IDR 36,132 and scenario 2 of IDR 42,162. Respondents were given repeated questions to determine which value to choose where scenario 1 had a short-term financing estimation that includes the financing of superior seeds, manure, liquid organic fertilizer, local microorganism, usage of 1 type of pesticide, and construction of a mini greenhouse. Meanwhile, scenario 2 had a long-term financing estimation that includes the financing of superior seeds, manure, liquid organic fertilizer, local microorganism, usage of 7 types of pesticides, and construction of a greenhouse. Respondents were given the option to choose the favorable bid and given an option not to choose either of them.

Calculating WTP Average

Table 8 Distribution of WTP Value of Respondents who Are Willing to Pay

WTP	Respondent	Percentage (%)	WTP x Respondents who are Willing to Pay
Rp 36,132	23	33.8	Rp 831,045
Rp 42,165	45	66.2	Rp 1,897,436
Total	68	100	Rp 2,728,481

To obtain the average value of WTP using the following calculation:

$$EWTP = \frac{IDR\ 2{,}728{,}481}{68}$$

EWTP = IDR 40,124
EWTP = IDR 41,000 (rounded off)

The average value of the WTP can be used as a reference in developing the conventional systems into organic plant systems that initially still use chemicals substances then change the system using the Integrated Pest Control system charged to vegetable farmers in the Tajuk Village, Getasan Sub-district, Semarang Regency.

Based on the interviews that have been conducted, 68 respondents are willing to pay more to buy the tools and components needed for the system development of a system that has been adapted to land conditions and plant types. Meanwhile, 6 people were unwilling to implement an integrated pest control system due to higher costs and fear of a possible crop failure due to the ineffective use of organic pesticides.

There is a majority of respondents who are willing to apply the pest control system provide further explanation about the high awareness of farmers in maintaining healthy and safe food quality and more knowledge about the importance of protecting the agricultural land environment so it could sustain in a long period.

Table 9 Total Value WTP

Total Value WTP	Farmers	Total WTP Per Harvest time
41,000	74	3,034,000

Based on the calculation results, the total value of the WTP from the number of vegetable farmers for the development of the system is IDR 3,034,000 for the occasional harvest. In comparison, the total annual WTP value is IDR 6,068,000 (obtained from two harvests per year). This value is the economic value of the development of an Integrated Pest Control system that can be done in the Tajuk Village.

Stakeholder Analysis

Stakeholder analysis is done with the aim to analyze the level of importance and the influence of each stakeholder in the development of an Integrated Pest Control system. The plan of the system development involves nine incorporated stakeholders. These stakeholders include the Department of Agriculture and Plantation, Horticultural Food Crops Research Institute (BPTPH), Pest and Disease Control (PHP), Officers of Plant Disturbing Organism Controller (POPT), Organic plant entrepreneurs, Village Authorities, Sub-district Authorities, Head of Farmers Groups and Academics.

Stakeholder Mapping Matrix

The relationship of the influence of stakeholder in the mapping matrix above can be explained through dependence and influence analysis, which is classified as key players are the Agriculture and Plantation Office, Horticultural Food Crops Research Institute (BPTPH), Pest and Disease Control (PHP), Officers of Plant Disturbing Organisms Controller (POPT), and the Coordination of each farmer group. While Crowd (audience) includes Businessman, Village Authority, and District authority, acts as a context setter in the Academic.

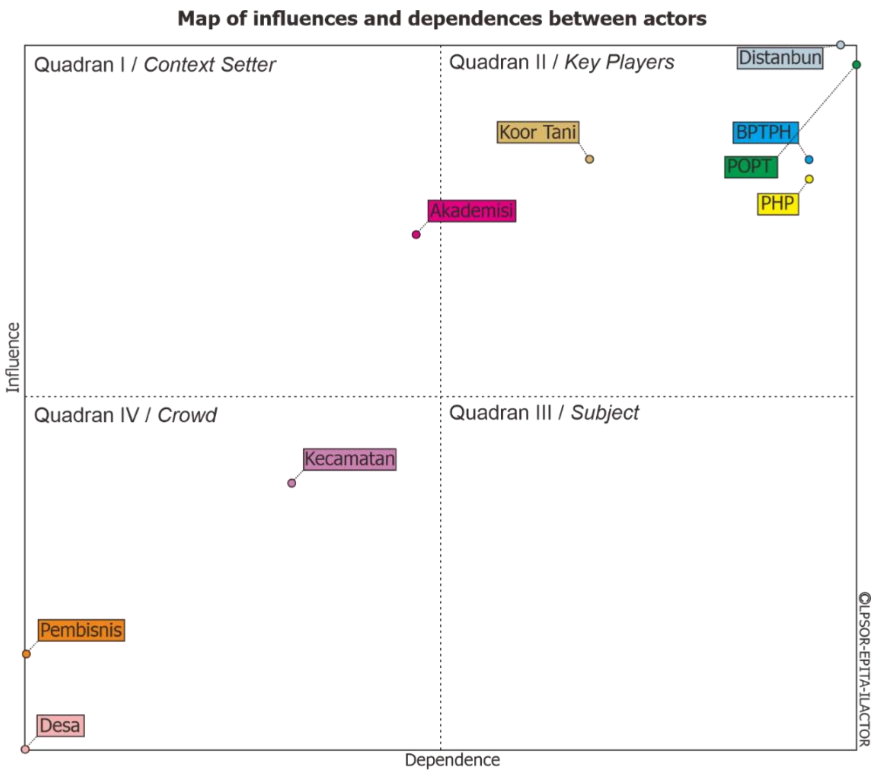

Figure 2 Stakeholder Mapping Matrix

The influence between stakeholders and the scale is 0 = low, 1 = less, 2 = enough, 3 = high, 4 = very high. While the interests of each stakeholder based on goals are measured on a scale of +4 or -4 = completely agree, +3 or -3 = strongly agree, +2 or -2 = agree, +1 or -1 = somewhat agree, 0 = neutral. Achievement of objectives consisting of (1) Improvement of agricultural systems (2) Improvement of environmental quality (3) Improvement of the quality of agricultural products and (4) Improvement of the economy of farmers in Tajuk Village was done and achieved by each stakeholder.

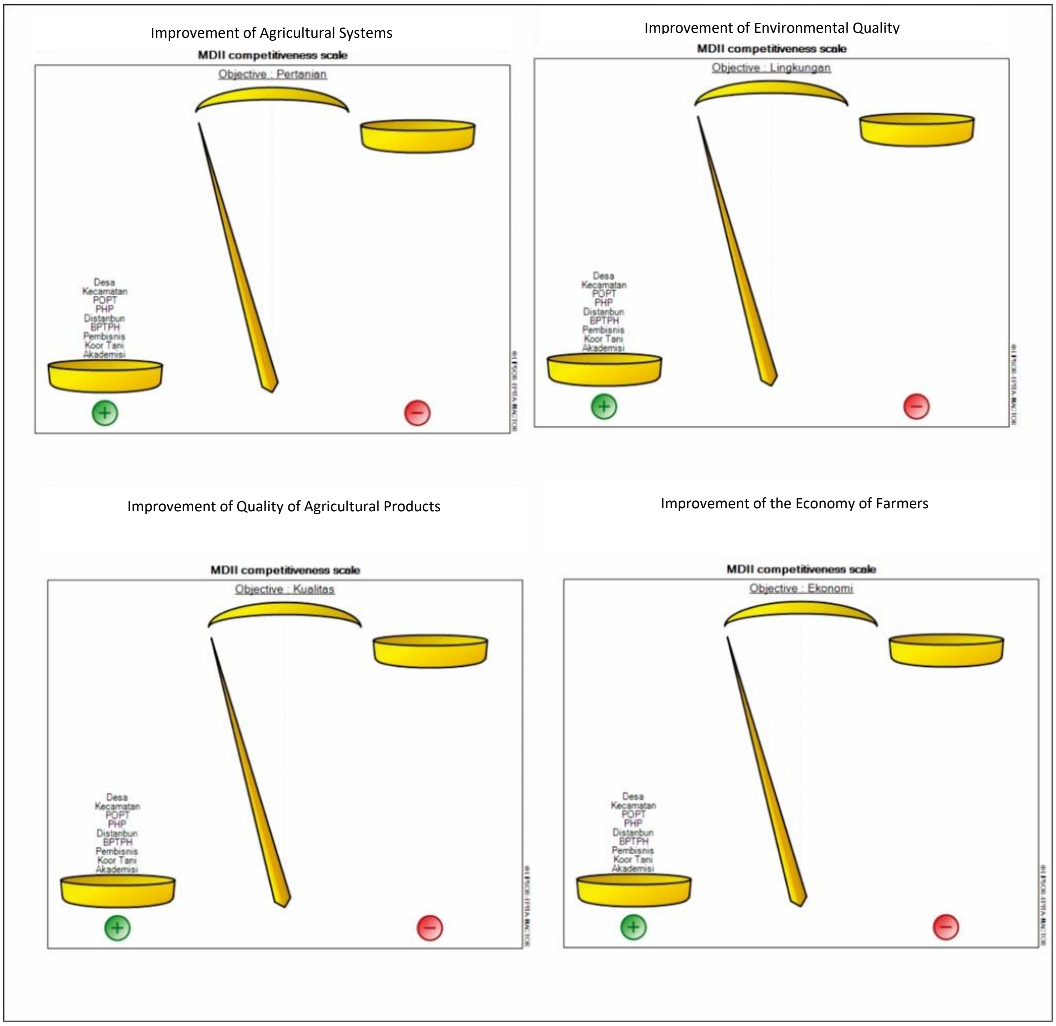

Figure 3 Achievement of objectives

Department of Agriculture and Plantations, Horticultural Food Crops Research Institute (BPTPH), Pest and Disease Control (PHP), Officers of Plant Disturbing Organisms Controller (POPT), Organic plant entrepreneurs, Village Authorities, Sub-district Authorities, Head of Farmers Groups and Academics agree or respond in a positive way concerning the objectives of improving agricultural systems, improving environmental quality, improving the quality of agricultural products and improving the economy of farmers in Tajuk village.

Conclusion

The Willingness to Pay (WTP) average value as an effort to change the agricultural system, especially in vegetable plants, is IDR 41,000. The total WTP value towards the Integrated Pest Control system is IDR 3,034,000 for each harvest, and the total annual WTP value is IDR 6,068,000. Of 74 respondents, 5.54% (6 people) were unwilling to pay for the Integrated Pest Control system, and 94.55% (68) respondents were willing to pay for the Integrated Pest Control system in Tajuk Village, Getasan Sub-district, Semarang Regency. Actors who played as key players were HCRC, PPOOO, PC, Department of Agriculture and Plantation, and Farmer Groups. Actors who played as the crowd were Sub-district, Village, and Businessperson, while academics played as context setters.

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